CLAIMS:

1. An antenna system comprising:

a dielectric resonator antenna dimensioned to support:

a first mode characterized by a first center frequency and a first bandwidth; and

a second mode characterized by a second center frequency and a second bandwidth; wherein

the first bandwidth is at least about one-half of a difference between the first center frequency and the second center frequency.

2. The antenna system according to claim 1 wherein:

the second bandwidth is at least about one-half of the difference between the first center frequency and the second center frequency.

3. The antenna system according to claim 2 wherein:

the first bandwidth is less than about two times the difference between the first center frequency and the second center frequency; and

the second bandwidth is equal to less than about two times the difference between the first center frequency and the second center frequency.

4. The antenna system according to claim 3 wherein:

the dielectric resonator antenna is prism shaped.

5. An antenna system comprising:
a dielectric resonator antenna characterized by:
a surface area, A;
a volume, V; and
a quantity $A*\lambda/V$ that is at least about 50,
where λ is a free space wavelength corresponding to a center frequency of a lowest order mode of the dielectric resonator antenna.

6. The antenna system according to claim 5 wherein:
the quantity $A*\lambda/V$ is at least about 100.

7 The antenna system according to claim 5 wherein the dielectric resonator antenna has a dielectric constant of at least about 25.

8. The antenna system according to claim 7 wherein the dielectric resonator antenna has a dielectric constant of at least about 40.

9. The antenna system according to claim 8 wherein:
the dielectric resonator antenna is made from material selected from the group consisting of: Neodymium Titanate and Magnesium Calcium Titanate.

10. The antenna system according to claim 5 wherein:
The dielectric resonator antenna includes:
a first large area surface;
a second large area surface; and
is further characterized by:
a thickness T measured between the first large area surface and the second large area surface;
a height, H; and
a length, L.

11. The antenna system according to claim 10 wherein:
a ratio of the length of the dielectric resonator antenna to the thickness of the dielectric resonator antenna is at least about 10.

12. The antenna system according to claim 11 wherein:
the height of the dielectric resonator antenna is between about ¼ and one times the length of the dielectric resonator antenna.

13. The antenna system according to claim 12 wherein:
the dielectric resonator antenna is right parallelepiped in shape.

14. The antenna system according to claim 5 further comprising:
a first edge extending between the first large area surface and the second large area surface; and
a microstrip arranged parallel to and adjacent to the first edge.

15. The antenna system according to claim 14 further comprising: a spacer layer located between the microstrip and the first edge of the dielectric resonator antenna.

16. The antenna system according to claim 15 wherein: the spacer layer comprises a material selected from the group consisting of polytetrafluoroethylene, air, and paper.

17. The antenna system according to claim 15 wherein: the spacer layer has a thickness of between about 50 and 500 microns, and a dielectric constant of less than about 4.

18. The antenna system according to claim 5 further comprising: a conductive shield that has a width measured parallel to the thickness of the dielectric resonator antenna that is equal to at least about 0.95 times the height of the dielectric resonator antenna.

19. The antenna system according to claim 18 wherein: the width of the conductive shield is less than about 3.5 times the height of the dielectric resonator antenna.

20. The antenna system according to claim 18 wherein: the conductive shield comprises a microstrip ground plane.

21. An antenna system comprising:

a dielectric resonator antenna; and

a microstrip including one or more charge accumulation regions proximate to the dielectric resonator antenna.

22. The antenna system according to claim 21 wherein the microstrip comprises three or more charge accumulation regions.

23. The antenna system according to claim 22 wherein:

the dielectric resonator antenna is parallelepiped in shape and comprises:

a first large area surface characterized by a height, and a length that is measured parallel to the microstrip;

a second large area surface that is characterized by the height and the length, is opposite to the first large area surface, and is separated from the first large area surface by a thickness dimension; and

a first edge that extends between the first large area surface and the second large area surface and is located proximate to the three or more charge accumulation regions.

24. The antenna system according to claim 23 wherein:

a ratio of the length to the thickness dimension is at least about 10.

25. The antenna system according to claim 24 wherein:

the dielectric resonator antenna has a dielectric constant of at least about twenty five.

26. The antenna system according to claim 25 wherein:

the dielectric resonator antenna has a dielectric constant of at least about forty.

27. The antenna system according to claim 26 further comprising: a spacer layer located between the dielectric resonator antenna and the microstrip that has a dielectric constant of less than about 4 and a thickness between about 50 and 500 microns.

28. The antenna system according to claim 27 wherein: the spacer layer comprises a material selected from the group consisting of polytetrafluoroethylene, paper, and air.

29. An antenna system comprising:

a dielectric resonator antenna including:

a first large area surface;

a second large area surface opposite to the first large area surface; and

a first edge that extends between the first large area surface and the second large area surface;

a parasitic element positioned along the first edge; and

a signal feed for coupling signals to and from the dielectric resonator antenna.

30. The antenna system according to claim 29 wherein the parasitic element is capacitively loaded.

31. The antenna system according to claim 30 wherein:
the parasitic element comprises a first metal strip including a first end.

32. The antenna system according to 31 wherein:
the dielectric resonator antenna further comprises:

a second edge that extends between the first large area surface and the second large area surface; and

the signal feed comprises:

a microstrip that is arranged parallel to and adjacent to the second edge.

33 The antenna system according to claim 32 further comprising:

a capacitive coupling element that capacitively couples the first metal strip and the microstrip.

34. The antenna system according to claim 33 wherein:
the capacitive coupling element comprises:
a second metal strip that extends from the first metal strip over the first large area surface toward the microstrip.

35. The antenna system according to claim 32 wherein:
the first edge is opposite to the second edge.

36. The antenna system according to claim 35 wherein:
the dielectric resonator antenna is a parallelepiped characterized by:
a height measured between the first edge, and the second edge;
a resonator length corresponding to a length of the first edge; and
a thickness measured between the first large area surface and the second large area surface; and
a ratio of the height to the resonator length is more than about 0.5.

37. The antenna system according to claim 36 wherein:
the dielectric resonator antenna has a dielectric constant of at least about twenty-five.

38. The antenna system according to claim 37 further comprising:
a spacer layer that has a dielectric constant that is less than about 4 located between the dielectric resonator antenna and the microstrip.

39. The antenna system according to claim 38 wherein:
the spacer layer has a thickness of between 50 and 500 microns.

40. A antenna system comprising:

a dielectric resonator antenna;

a transmission line electromagnetically coupled to the dielectric resonator antenna;

a conductor including:

a first end positioned proximate the dielectric resonator antenna; and

a second end; and

an electromagnetic coupling for coupling the second end to the transmission line.

41 The antenna system according to claim 40 wherein the dielectric resonator antenna comprises:

a first large area surface;

a second large area surface opposite to the first large area surface; and

a first edge that extends between the first large area surface and the second large area surface; and

the dielectric resonator antenna is characterized by a height dimension measured along the first large area surface in a direction perpendicular to the first edge.

42. The antenna system according to claim 41 wherein the transmission line comprises:

a microstrip that is positioned adjacent to and parallel to the first edge.

43. The antenna system according to 41 wherein the electromagnetic coupling comprises a capacitive coupling.

44. The antenna system according to claim 43 wherein:
the capacitive coupling comprises an insulator interposed between the microstrip and the conductor.

45. The antenna system according to claim 43 wherein the conductor comprises:
a metal ribbon including:
a middle section that is aligned parallel to the height of the dielectric resonator antenna and is spaced from the dielectric resonator antenna;
a first end section that is capacitively coupled to and aligned parallel to the microstrip; and
a second end section that is parallel to the first end section and at least partially overlies the dielectric resonator antenna.

46 The antenna system according to claim 43 wherein:
the microstrip comprises:
a first section that is approximately adjacent to and parallel to the edge of the dielectric resonator antenna;
a second section that is offset from the first section; and
an intermediate section between the first section and the second section; and
the capacitive coupling comprises:
a first plurality of fingers extending from the first section; and
a pad that is located at a side of the second section, in line with the first section, is coupled to the conductor, and includes a second plurality of fingers that are interdigitated with the first plurality of fingers.

47. The antenna system according to claim 46 wherein:
the capacitive coupling further comprises:

a dielectric material overlying the interdigitated first plurality of fingers and second plurality of fingers.

48. An antenna system comprising:

a ground plane;

a circuit substrate including an obverse side and a reverse side that includes a first area covered by the ground plane and a second area that is not covered by the ground plane;

a dielectric resonator antenna supported on the obverse side, over the clear area, the dielectric resonator antenna including an edge; and

a microstrip on the obverse side, the microstrip including an end segment parallel to and proximate to the edge.

49. The antenna system according to claim 48 wherein:

the dielectric resonator antenna comprises a parallelepiped characterized by a length, height, and a thickness measured perpendicular the circuit substrate, and a ratio of the length to the thickness is at least about 10.

50. The antenna system according to claim 48 wherein:

the dielectric resonator antenna is characterized by:

a surface area A;

a volume V; and

a quantity $A * \lambda / V$ that is at least about 50,

where λ is a free space wavelength associated with a lowest order mode of the dielectric resonator antenna.

51.A wireless telephone having a front side and a back side, the wireless telephone further comprising:

a speaker mounted at the front side of the wireless telephone;

a microphone mounted at the front side of the wireless telephone;

a dielectric resonator antenna positioned within the wireless telephone; and

a conductive shield located between the dielectric resonator antenna and the front side.

52. The wireless telephone according to claim 51 further wherein:

the conductive shield comprises a ground plane.

53. The wireless telephone according to claim 52 further comprising:

a substrate including:

a first surface supporting the ground plane; and

a second surface supporting the dielectric resonator antenna.